












HCM Unsignalized Intersection Capacity Analysis

21: Frontage Rd & US 276

2035 PM Woodruff Improvements

7/6/2011










| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | SEL | SET | NWT | NWR |
| Lane Configurations |  | |  |  |  |  |
| Volume (veh/h) | 69 | 160 | 50 | 2770 | 2206 | 71 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Hourly flow rate (vph) | 77 | 178 | 56 | 3078 | 2451 | 79 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (ft) | | | | | 1009 | |
| pX, platoon unblocked | 0.56 | 0.56 | 0.56 | | | |
| vC, conflicting volume | 4141 | 1265 | 2530 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 5026 | 0 | 2165 | | | |
| tC, single (s) | 6.9 | 7.0 | 4.2 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 0 | 71 | 58 | | | |
| cM capacity (veh/h) | 0 | 605 | 131 | | | |
| Direction, Lane # | WB 1 | SE 1 | SE 2 | SE 3 | NW 1 | NW 2 |
| Volume Total | 254 | 56 | 1539 | 1539 | 1634 | 896 |
| Volume Left | 77 | 56 | 0 | 0 | 0 | 0 |
| Volume Right | 178 | 0 | 0 | 0 | 0 | 79 |
| cSH | 0 | 131 | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity | 712.03 | 0.42 | 0.91 | 0.91 | 0.96 | 0.53 |
| Queue Length 95th (ft) | Err | 46 | 0 | 0 | 0 | 0 |
| Control Delay (s) | Err | 51.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lane LOS | F | F | | | | |
| Approach Delay (s) | Err | 0.9 | | | 0.0 | |
| Approach LOS | F | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 430.4 | | | |
| Intersection Capacity Utilization | | | 96.9% | | ICU Level of Service | F |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

22: US 276 & St Josephs Dr

2035 PM Woodruff Improvements

7/6/2011












| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | SET | SER | NWL | NWT | NEL | NER |
| Lane Configurations |  | | |  |  | |
| Volume (veh/h) | 2290 | 549 | 113 | 1784 | 493 | 348 |
| Sign Control | Free | | | Free | Stop | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Hourly flow rate (vph) | 2544 | 610 | 126 | 1982 | 548 | 387 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | None | | | None | | |
| Median storage (veh) | | | | | | |
| Upstream signal (ft) | | | | 861 | | |
| pX, platoon unblocked | | | | | 0.53 | |
| vC, conflicting volume | | | 3154 | | 4092 | 1577 |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | | | 3154 | | 5053 | 1577 |
| tC, single (s) | | | 4.2 | | 6.9 | 7.0 |
| tC, 2 stage (s) | | | | | | |
| tF (s) | | | 2.2 | | 3.5 | 3.3 |
| p0 queue free % | | | 0 | | 0 | 0 |
| cM capacity (veh/h) | | | 92 | | 0 | 95 |
| Direction, Lane # | SE 1 | SE 2 | NW 1 | NW 2 | NE 1 | |
| Volume Total | 1696 | 1458 | 786 | 1321 | 934 | |
| Volume Left | 0 | 0 | 126 | 0 | 548 | |
| Volume Right | 0 | 610 | 0 | 0 | 387 | |
| cSH | 1700 | 1700 | 92 | 1700 | 0 | |
| Volume to Capacity | 1.00 | 0.86 | 1.36 | 0.78 | Err | |
| Queue Length 95th (ft) | 0 | 0 | 231 | 0 | Err | |
| Control Delay (s) | 0.0 | 0.0 | 298.8 | 0.0 | Err | |
| Lane LOS | | | F | | F | |
| Approach Delay (s) | 0.0 | | 111.5 | | Err | |
| Approach LOS | | | | | F | |
| Intersection Summary | | | | | | |
| Average Delay | | | Err | | | |
| Intersection Capacity Utilization | | | 189.5% | | ICU Level of Service | H |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis

29: Rothwell Dr & E Butler Road

2035 PM Woodruff Improvements

7/6/2011











| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
| Lane Configurations |  |  |  |  |  | |
| Volume (veh/h) | 30 | 8 | 2 | 1101 | 1518 | 2 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Hourly flow rate (vph) | 33 | 9 | 2 | 1223 | 1687 | 2 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | 5 | | | | |
| Median type | | | | TWLTL | TWLTL | |
| Median storage (veh) | | | | 2 | 2 | |
| Upstream signal (ft) | | | | 1175 | 377 | |
| pX, platoon unblocked | 0.87 | 0.82 | 0.82 | | | |
| vC, conflicting volume | 2304 | 844 | 1689 | | | |
| vC1, stage 1 conf vol | 1688 | | | | | |
| vC2, stage 2 conf vol | 616 | | | | | |
| vCu, unblocked vol | 1285 | 382 | 1408 | | | |
| tC, single (s) | 6.9 | 7.0 | 4.2 | | | |
| tC, 2 stage (s) | 5.9 | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 78 | 98 | 99 | | | |
| cM capacity (veh/h) | 150 | 500 | 383 | | | |
| Direction, Lane # | EB 1 | NB 1 | NB 2 | NB 3 | SB 1 | SB 2 |
| Volume Total | 42 | 2 | 612 | 612 | 1124 | 564 |
| Volume Left | 33 | 2 | 0 | 0 | 0 | 0 |
| Volume Right | 9 | 0 | 0 | 0 | 0 | 2 |
| cSH | 190 | 383 | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity | 0.22 | 0.01 | 0.36 | 0.36 | 0.66 | 0.33 |
| Queue Length 95th (ft) | 20 | 0 | 0 | 0 | 0 | 0 |
| Control Delay (s) | 30.7 | 14.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lane LOS | D | B | | | | |
| Approach Delay (s) | 30.7 | 0.0 | | | 0.0 | |
| Approach LOS | D | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 0.4 | | | | |
| Intersection Capacity Utilization | | 52.0% | | ICU Level of Service | | A |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

32: New Commerce Ct & E Butler Road

2035 PM Woodruff Improvements

7/6/2011




















| |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
| Lane Configurations |  | |  | |  |  |
| Volume (veh/h) | 80 | 91 | 1531 | 6 | 80 | 2399 |
| Sign Control | Stop | | Free | | Free | Free |
| Grade | 0% | | 0% | | 0% | 0% |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Hourly flow rate (vph) | 89 | 101 | 1701 | 7 | 89 | 2666 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | None | | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (ft) | | | 369 | | | |
| pX, platoon unblocked | 0.83 | 0.83 | | | 0.83 | |
| vC, conflicting volume | 3215 | 854 | | | 1708 | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 3260 | 402 | | | 1436 | |
| tC, single (s) | 6.9 | 7.0 | | | 4.2 | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | |
| p0 queue free % | 0 | 79 | | | 76 | |
| cM capacity (veh/h) | 4 | 487 | | | 375 | |
| Direction, Lane # | WB 1 | NB 1 | NB 2 | SB 1 | SB 2 | SB 3 |
| Volume Total | 190 | 1134 | 574 | 89 | 1333 | 1333 |
| Volume Left | 89 | 0 | 0 | 89 | 0 | 0 |
| Volume Right | 101 | 0 | 7 | 0 | 0 | 0 |
| cSH | 9 | 1700 | 1700 | 375 | 1700 | 1700 |
| Volume to Capacity | 21.69 | 0.67 | 0.34 | 0.24 | 0.78 | 0.78 |
| Queue Length 95th (ft) | Err | 0 | 0 | 23 | 0 | 0 |
| Control Delay (s) | Err | 0.0 | 0.0 | 17.6 | 0.0 | 0.0 |
| Lane LOS | F | | | C | | |
| Approach Delay (s) | Err | 0.0 | | 0.6 | | |
| Approach LOS | F | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | 408.7 | | | | |
| Intersection Capacity Utilization | | 83.0% | | ICU Level of Service | | E |
| Analysis Period (min) | | 15 | | | | |

HCM Unsignalized Intersection Capacity Analysis

33: E Butler Road & Brookfield Pkwy

2035 PM Woodruff Improvements

7/6/2011

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | NBL | NBT | NBR | SBL | SBT | SBR | SEL | SET | SER | NWL | NWT | NWR |
| Lane Configurations |  |  | | |  | | |  |  | |  |  |
| Volume (veh/h) | 23 | 1593 | 6 | 2 | 2187 | 14 | 3 | 0 | 267 | 25 | 0 | 6 |
| Sign Control | Free | | | | Free | | | | Stop | | Stop | |
| Grade | 0% | | | | 0% | | | | 0% | | 0% | |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Hourly flow rate (vph) | 26 | 1770 | 7 | 2 | 2430 | 16 | 3 | 0 | 297 | 28 | 0 | 7 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | None | | | | None | | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (ft) | 939 | | | | | | | | | | | |
| pX, platoon unblocked | | | | 0.83 | | | 0.83 | | | 0.83 | | |
| vC, conflicting volume | 2446 | | | 1777 | | | 3385 | | | 4270 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 2446 | | | 1518 | | | 3466 | | | 4538 | | |
| tC, single (s) | 4.2 | | | 4.2 | | | 7.6 | | | 6.6 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | | | 4.0 | | |
| p0 queue free % | 86 | | | 99 | | | 0 | | | 100 | | |
| cM capacity (veh/h) | 180 | | | 348 | | | 2 | | | 1 | | |
| Direction, Lane # | NB 1 | NB 2 | NB 3 | SB 1 | SB 2 | SE 1 | SE 2 | NW 1 | NW 2 | | | |
| Volume Total | 26 | 1180 | 597 | 1217 | 1231 | 3 | 297 | 28 | 7 | | | |
| Volume Left | 26 | 0 | 0 | 2 | 0 | 3 | 0 | 28 | 0 | | | |
| Volume Right | 0 | 0 | 7 | 0 | 16 | 0 | 297 | 0 | 7 | | | |
| cSH | 180 | 1700 | 1700 | 348 | 1700 | 2 | 167 | 0 | 458 | | | |
| Volume to Capacity | 0.14 | 0.69 | 0.35 | 0.01 | 0.72 | 1.94 | 1.78 | Err | 0.01 | | | |
| Queue Length 95th (ft) | 12 | 0 | 0 | 0 | 0 | 31 | 535 | Err | 1 | | | |
| Control Delay (s) | 28.3 | 0.0 | 0.0 | 0.4 | 0.0 | 3685.3 | 420.1 | Err | 13.0 | | | |
| Lane LOS | D | | | A | | F | F | F | B | | | |
| Approach Delay (s) | 0.4 | | | 0.2 | | 456.3 | | Err | | | | |
| Approach LOS | | | | | | F | | F | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | | Err | | | | | | | | |
| Intersection Capacity Utilization | | | | 90.8% | | | ICU Level of Service | | | E | | |
| Analysis Period (min) | | | | 15 | | | | | | | | |
| | | | | | | | | | | | | |